II. AMENDMENTS TO THE CLAIMS

Please cancel claims 1 and 2, and add claims 3-53 as directed below. (The claims have been amended in the manner required by 37 C.F.R. §1.121, as amended July 30, 2003.)

1-2. (Canceled)

3. (New) A transmit/receive (T/R) phased array coil system for use with a magnetic resonance imaging (MRI) system having a transmitter and a data acquisition system, the T/R phased array coil system comprising:

(a) a first coil defining a first region;

(b) a second coil defining a second region, said first and said second coils defining an overlap region in which one of said coils is partially overlapped by the other of said coils to form a phased array coil subsystem;

(c) a power splitter for allocating between said first and said second coils radio frequency (RF) power received from said transmitter;

(d) an attenuator for reducing said RF power allocated to at least one of said first and said second coils;

(e) a phase compensator for affecting a phase relationship between (I) a first magnetic field producible through said first coil over said first region corresponding thereto and (II) a second magnetic field producible through said second coil over said second region corresponding thereto; and

(f) a plurality of switches for enabling switching between (I) a transmit state wherein said phased array coil subsystem is coupled to said transmitter and decoupled from said data acquisition

system so that a substantially uniform magnetic field is formed in (A) said overlap region by interaction of said first and said second magnetic fields and (B) at least portions of said first and said second regions outside said overlap region predominantly by said first and said second magnetic fields, respectively, thereby enabling said phased array coil subsystem to apply said substantially uniform magnetic field to an anatomical structure placed within at least one of said first region, said second region and said overlap region; and (II) a receive state wherein said phased array coil subsystem is decoupled from said transmitter and coupled to said data acquisition system thereby enabling a response of said anatomical structure to said substantially uniform magnetic field received by said phased array coil subsystem to be conveyed to said data acquisition subsystem.

4. (New) The T/R phased array coil system of claim 3 further comprising a ninety degree element for at least one of said first and said second coils, said ninety degree element operable to:

(a) split said RF power allocated to said coil corresponding thereto into a pair of coil-exciting signals, and

(b) phase-shift one of said coil-exciting signals relative to the other of said coil-exciting signals, with said one of said coil-exciting signals being applied to said coil corresponding thereto at a point ninety degrees apart from the other so that said magnetic field generated therewith, and produced over said region corresponding thereto, is circularly polarized, thereby employing said coil corresponding thereto as a quadrature coil.

5. (New) The T/R phased array coil system of claim 3 further comprising a ninety degree element for at least one of said first and said second coils, said ninety degree element operable to:

(a) split said RF power allocated to said coil corresponding thereto into a pair of coil-exciting signals; and

(b) phase-shift one of said coil-exciting signals relative to the other of said coil-exciting signals.

6. (New) The T/R phased array coil system of claim 3 wherein at least one of said first and said second coils is a quadrature coil.

7. (New) The T/R phased array coil system of claim 3 wherein said first coil is one of crossed saddle coils, a Helmholtz pair, and a birdcage coil; and said second coil is one of crossed saddle coils, a Helmholtz pair, and a birdcage coil.

8. (New) The T/R phased array coil system of claim 3 wherein said first and said second coils each detect said response as a magnetic resonance signal of a portion of said anatomical structure covered thereby, with said magnetic resonance signals of each of said coils being conveyed to a separate processing port of said data acquisition system.

9. (New) The T/R phased array coil system of claim 3 wherein at least one of said first and said second coils detects said response as quadrature components of a magnetic resonance signal of a portion of said anatomical structure covered thereby, with said quadrature components of each of said coils being conveyed to a separate processing port of said data acquisition system.

10. (New) The T/R phased array coil system of claim 3 wherein:

(a) in said transmit state, said plurality of switches (A) couple said phased array coil subsystem to a transmit port of said transmitter and (B) decouple said phased array coil subsystem from processing ports of said data acquisition system; and

(b) in said receive state, said plurality of switches (A) decouple said phased array coil subsystem from said transmit port of said transmitter and (B) couple said phased array coil subsystem to said processing ports of said data acquisition system.

11. (New) The T/R phased array coil system of claim 3 wherein said plurality of switches are PIN diodes.

12. (New) The T/R phased array coil system of claim 3 wherein at least one of said first and said second coils is a volume coil.

13. (New) A transmit/receive (T/R) phased array coil system for use with a magnetic resonance imaging (MRI) system having a transmitter and a data acquisition system, the T/R phased array coil system comprising:

(a) a first volume coil defining a first region;

(b) a second volume coil defining a second region, said first and said second volume coils defining an overlap region in which one of said volume coils is partially disposed within the other of said volume coils to form a phased array coil subsystem; and

(c) an interface subsystem operably coupled to said phased array coil subsystem, said interface subsystem comprising:

(I) a power splitter for allocating between said first and said second volume coils radio frequency (RF) power received from said transmitter;

(II) a phase compensator for affecting a phase relationship between (A) a first magnetic field producible through said first volume coil over said first region corresponding thereto and (B) a second magnetic field producible through said second volume coil over said second region corresponding thereto; and

(III) a plurality of switches for enabling said interface subsystem to be switched between (A) a transmit state wherein said phased array coil subsystem is coupled to said transmitter and decoupled from said data acquisition system so that a substantially uniform magnetic field is formed over (1) said overlap region by interaction of said first and said second magnetic fields and (2) at least portions of said first and said second regions outside said overlap region predominantly by said first and said second magnetic fields, respectively, thereby enabling said phased array coil subsystem to apply said substantially uniform magnetic field to an anatomical structure placed within at least one of said first, said second and said overlap regions; and (B) a receive state wherein said phased array coil subsystem is decoupled from said transmitter and coupled to said data acquisition system thereby enabling a response of said anatomical structure to said substantially uniform magnetic field to be conveyed through said phased array coil subsystem to said data acquisition subsystem.

14. (New) The T/R phased array coil system of claim 13 wherein said interface subsystem further includes an attenuator for reducing said RF power allocated to at least one of said first and said second volume coils.

15. (New) The T/R phased array coil system of claim 13 wherein said interface subsystem further comprises a ninety degree element for at least one of said first and said second volume coils, said ninety degree element operable to:

(a) split said RF power allocated to said volume coil corresponding thereto into a pair of coil-exciting signals, and

(b) phase-shift one of said coil-exciting signals relative to the other of said coil-exciting signals, with said one of said coil-exciting signals being applied to said volume coil corresponding thereto at a point ninety degrees apart from the other so that said magnetic field generated therewith, and produced over said region corresponding thereto, is circularly polarized, thereby employing said volume coil corresponding thereto as a quadrature coil.

16. (New) The T/R phased array coil system of claim 13 wherein said interface subsystem further comprises a ninety degree element for at least one of said first and said second volume coils, said ninety degree element operable to:

(a) split said RF power allocated to said volume coil corresponding thereto into a pair of coil-exciting signals; and

(b) phase-shift one of said coil-exciting signals relative to the other of said coil-exciting signals.

17. (New) The T/R phased array coil system of claim 13 wherein at least one of said first and said second volume coils is a quadrature coil.

18. (New) The T/R phased array coil system of claim 13 wherein said first volume coil is one of crossed saddle coils, a Helmholtz pair, and a birdcage coil; and said second volume coil is one of crossed saddle coils, a Helmholtz pair, and a birdcage coil.

19. (New) The T/R phased array coil system of claim 13 wherein said first and said second volume coils each detect said response as a magnetic resonance signal of a portion of said anatomical structure covered thereby, with said magnetic resonance signals of each of said volume coils being conveyed to a separate image processing port of said data acquisition system.

20. (New) The T/R phased array coil system of claim 13 wherein at least one of said first and said second volume coils detects said response as quadrature components of a magnetic resonance signal of a portion of said anatomical structure covered thereby, with said quadrature components of each of said volume coils being conveyed to a separate image processing port of said data acquisition system.

21. (New) The T/R phased array coil system of claim 13 wherein:

(a) in said transmit state, said plurality of switches (A) couple said phased array coil subsystem to a transmit port of said transmitter and (B) decouple said phased array coil subsystem from image processing ports of said data acquisition system; and

(b) in said receive state, said plurality of switches (A) decouple said phased array coil subsystem from said transmit port of said transmitter and (B) couple said phased array coil subsystem to said image processing ports of said data acquisition system.

22. (New) The T/R phased array coil system of claim 13 wherein said plurality of switches are PIN diodes.

23. (New) A transmit/receive (T/R) phased array coil system for use with a magnetic resonance imaging (MRI) system, the T/R phased array coil system comprising:

(a) a first coil covering a first region;

(b) a second coil covering a second region, said first and said second coils defining an overlap region in which one of said coils is partially overlapped by the other of said coils to form a phased array coil subsystem; and

(c) an interface subsystem connected to said phased array coil subsystem, said interface subsystem comprising a power splitter, an attenuator, a phase compensator, and a plurality of switches for enabling said interface subsystem to be switched between:

(I) a transmit state wherein (A) said power splitter allocates radio frequency (RF) power received from said MRI system between said first and said second coils with said attenuator reducing said RF power directed to at least one of said first and said second coils so

that (i) a first magnetic field is applied through said first coil to said first region corresponding thereto and (ii) a second magnetic field is applied through said second coil to said second region corresponding thereto and (B) said phase compensator affects a phase relationship between said first and said second magnetic fields so as to cause a resultant magnetic field of substantial uniformity to be formed not only in (i) at least portions of said first and said second regions outside said overlap region predominantly by said first and said second magnetic fields, respectively, but also in (ii) said overlap region by interaction of said first and said second magnetic fields, thereby enabling said phased array coil subsystem to apply said resultant magnetic field to an anatomical structure placed within at least one of said first region, said second region and said overlap region; and

(II) a receive state wherein said interface subsystem receives from said phased array coil subsystem a response of said anatomical structure to said resultant magnetic field and conveys said response to said MRI system.

24. (New) The T/R phased array coil system of claim 23 wherein at least one of said first and said second coils is a volume coil.

25. (New) The T/R phased array coil system of claim 23 wherein said interface subsystem further comprises a ninety degree element for at least one of said first and said second coils, said ninety degree element operable to:

(a) split said RF power allocated to said coil corresponding thereto into a pair of coil-exciting signals, and

(b) phase-shift one of said coil-exciting signals relative to the other of said coil-exciting signals, with said one of said coil-exciting signals being applied to said coil corresponding thereto at a point ninety degrees apart from the other so that said magnetic field generated therewith, and produced over said region corresponding thereto, is circularly polarized, thereby employing said coil corresponding thereto as a quadrature coil.

26. (New) The T/R phased array coil system of claim 23 wherein said interface subsystem further comprises a ninety degree element for at least one of said first and said second coils, said ninety degree element operable to:

(a) split said RF power allocated to said coil corresponding thereto into a pair of coil-exciting signals; and

(b) phase-shift one of said coil-exciting signals relative to the other of said coil-exciting signals.

27. (New) The T/R phased array coil system of claim 23 wherein at least one of said first and said second coils is a quadrature coil.

28. (New) The T/R phased array coil system of claim 23 wherein said first coil is one of crossed saddle coils, a Helmholtz pair, and a birdcage coil; and said second coil is one of crossed saddle coils, a Helmholtz pair, and a birdcage coil.

29. (New) The T/R phased array coil system of claim 23 wherein said first and said second coils each detect said response as a magnetic resonance signal of a portion of said anatomical structure covered thereby, with said magnetic resonance signals of each of said coils being conveyed to a separate processing port of a data acquisition system of said MRI system.

30. (New) The T/R phased array coil system of claim 23 wherein at least one of said first and said second coils detects said response as quadrature components of a magnetic resonance signal of a portion of said anatomical structure covered thereby, with said quadrature components of each of said coils being conveyed to a separate processing port of a data acquisition system of said MRI system.

31. (New) The T/R phased array coil system of claim 23 wherein:

(a) in said transmit state, said plurality of switches (A) couple said phased array coil subsystem to a transmit port of said transmitter and (B) decouple said phased array coil subsystem from processing ports of a data acquisition system of said MRI system; and

(b) in said receive state, said plurality of switches (A) decouple said phased array coil subsystem from said transmit port of said transmitter and (B) couple said phased array coil subsystem to said processing ports of said data acquisition system.

32. (New) The T/R phased array coil system of claim 23 wherein said plurality of switches are PIN diodes.

33. (New) A transmit/receive (T/R) phased array coil system for use with a magnetic resonance imaging (MRI) system, the T/R phased array coil system comprising:

(a) a first coil covering a first region;

(b) a second coil covering a second region, said first and said second coils defining an overlap region in which one of said coils is partially overlapped by the other of said coils to form a phased array coil subsystem; and

(c) an interface subsystem connected to said phased array coil subsystem, said interface subsystem comprising a power splitter, an attenuator, a phase compensator, and a plurality of switches for enabling said interface subsystem to be switched between:

(I) a transmit state wherein said power splitter allocates radio frequency (RF) power received from said MRI system between said first and said second coils with said attenuator reducing said RF power directed to at least one of said first and said second coils so that (A) a first magnetic field is applied through said first coil to said first region corresponding thereto and (B) a second magnetic field is applied through said second coil to said second region corresponding thereto with said phase compensator affecting a phase relationship between said first and said second magnetic fields so as to cause a resultant magnetic field to be substantially uniform not only over at least portions of said first and said second regions outside said overlap region but also over said overlap region by interaction of said first and said second magnetic fields, thereby enabling said phased array coil subsystem to apply said resultant magnetic field to an anatomical structure placed within at least one of said first region, said second region and said overlap region; and

(II) a receive state wherein said interface subsystem receives from said phased array coil subsystem a response of said anatomical structure to said resultant magnetic field and conveys said response to said MRI system.

34. (New) The T/R phased array coil system of claim 33 wherein at least one of said first and said second coils is a volume coil.

35. (New) The T/R phased array coil system of claim 33 wherein said attenuator is connected between said splitter and a smaller of said first and said second coils.

36. (New) The T/R phased array coil system of claim 35 wherein said interface subsystem further comprises a first ninety degree element connected between said attenuator and said smaller of said first and said second coils.

37. (New) The T/R phased array coil system of claim 35 wherein said phase compensator is connected between said splitter and a larger of said first and said second coils, and said interface subsystem further comprises a second ninety degree element connected between said phase compensator and said larger of said first and said second coils.

38. (New) The T/R phased array coil system of claim 33 wherein at least one of said first and said second coils is a quadrature coil.

39. (New) The T/R phased array coil system of claim 33 wherein said first coil is one of crossed saddle coils, a Helmholtz pair, and a birdcage coil; and said second coil is one of crossed saddle coils, a Helmholtz pair, and a birdcage coil.

40. (New) The T/R phased array coil system of claim 33 wherein said first and said second coils each detect said response as a magnetic resonance signal of a portion of said anatomical structure covered thereby, with said magnetic resonance signals of each of said coils being conveyed to a separate image processing port of a data acquisition system of said MRI system.

41. (New) The T/R phased array coil system of claim 33 wherein at least one of said first and said second coils detects said response as quadrature components of a magnetic resonance signal of a portion of said anatomical structure covered thereby, with said quadrature components of each of said coils being conveyed to a separate image processing port of a data acquisition system of said MRI system.

42. (New) The T/R phased array coil system of claim 33 wherein:

(a) in said transmit state, said plurality of switches (A) couple said phased array coil subsystem to a transmit port of said transmitter and (B) decouple said phased array coil subsystem from image processing ports of a data acquisition system of said MRI system; and

(b) in said receive state, said plurality of switches (A) decouple said phased array coil subsystem from said transmit port of said transmitter and (B) couple said phased array coil subsystem to said image processing ports of said data acquisition system.

43. (New) The T/R phased array coil system of claim 33 wherein said plurality of switches are PIN diodes.

44. (New) A transmit/receive (T/R) phased array coil system for use with a magnetic resonance imaging (MRI) system, the T/R phased array coil system comprising:

(a) a first birdcage coil encompassing a first region;

(b) a second birdcage coil encompassing a second region, said first and said second birdcage coils defining an overlap region in which one of said birdcage coils is partially overlapped by the other of said birdcage coils to form a phased array coil subsystem; and

(c) an interface subsystem connected to said phased array coil subsystem, said interface subsystem comprising a power splitter, an attenuator, a phase compensator, and a plurality of switches for enabling said interface subsystem to be switched between:

(I) a transmit state wherein said power splitter allocates radio frequency (RF) power received from said MRI system between said first and said second birdcage coils with said attenuator reducing said RF power directed to at least one of said first and said second birdcage coils so that (A) a first magnetic field is applied through said first birdcage coil to said first region encompassed thereby and (B) a second magnetic field is applied through said second birdcage coil to said second region encompassed thereby with said phase compensator affecting a phase relationship between said first and said second magnetic fields so as to cause a resultant magnetic field to be substantially uniform not only over at least portions of said first and said second regions outside said overlap region but also over said overlap region by interaction of

said first and said second magnetic fields, thereby enabling said phased array coil subsystem to apply said resultant magnetic field to an anatomical structure placed within at least one of said first region, said second region and said overlap region; and

(II) a receive state wherein said interface subsystem receives from said phased array coil subsystem a response of said anatomical structure to said resultant magnetic field and conveys said response to said MRI system.

45. (New) The T/R phased array coil system of claim 44 wherein said attenuator is connected between said splitter and a smaller of said first and said second birdcage coils.

46. (New) The T/R phased array coil system of claim 45 wherein said interface subsystem further comprises a first ninety degree element connected between said attenuator and said smaller of said first and said second birdcage coils.

47. (New) The T/R phased array coil system of claim 45 wherein said phase compensator is connected between said splitter and a larger of said first and said second birdcage coils, and said interface subsystem further comprises a second ninety degree element connected between said phase compensator and said larger of said first and said second birdcage coils.

48. (New) The T/R phased array coil system of claim 44 wherein at least one of said first and said second birdcage coils is a quadrature coil.

49. (New) The T/R phased array coil system of claim 44 wherein said first and said second birdcage coils each detect said response as a magnetic resonance signal of a portion of said anatomical structure covered thereby, with said magnetic resonance signals of each of said birdcage coils being conveyed to a separate image processing port of a data acquisition system of said MRI system.

50. (New) The T/R phased array coil system of claim 44 wherein at least one of said first and said second birdcage coils detects said response as quadrature components of a magnetic resonance signal of a portion of said anatomical structure covered thereby, with said quadrature components of each of said birdcage coils being conveyed to a separate image processing port of a data acquisition system of said MRI system.

51. (New) The T/R phased array coil system of claim 44 wherein:

(a) in said transmit state, said plurality of switches (A) couple said phased array coil subsystem to a transmit port of said transmitter and (B) decouple said phased array coil subsystem from image processing ports of a data acquisition system of said MRI system; and

(b) in said receive state, said plurality of switches (A) decouple said phased array coil subsystem from said transmit port of said transmitter and (B) couple said phased array coil subsystem to said image processing ports of said data acquisition system.

52. (New) The T/R phased array coil system of claim 44 wherein said plurality of switches are PIN diodes.

53. (New) A transmit/receive (T/R) phased array coil system for use with a magnetic resonance (MRI) system, the T/R phased array coil system comprising:

(a) a first coil covering a first region;

(b) a second coil covering a second region, said first and said second coils defining an overlap region in which one of said coils is partially overlapped by the other of said coils to form a phased array coil subsystem; and

(c) an interface subsystem operably connected to said phased array coil subsystem, said interface subsystem capable of being switched between (I) a transmit state wherein a resultant magnetic field of substantial uniformity is generated not only over said first and said second regions, but also over said overlap region by interaction of first and second magnetic fields set up through said first and said second coils, respectively; and (II) a receive state wherein said interface subsystem receives a response of an anatomical structure placed within said phased array coil subsystem to said resultant RF magnetic field and conveys said response to said MRI system.